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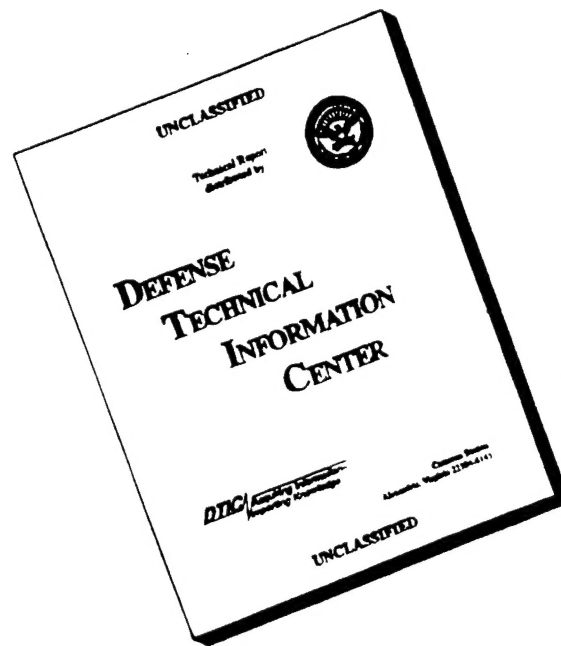
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**NAVAL AVIATION SYSTEMS
TEAM**



The Role of Verification and Validation in an Electronic Combat Installed System Test Facility

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Outline



- ISTF Definition and Purpose
- Verification and Validation (V&V)
- Description of the US Navy's ISTF
 - The Air Combat Environment Test and Evaluation Facility (ACETEF)
- ACETEF V&V Process Development
- Summary

NAVAL AVIATION SYSTEMS

TEAM

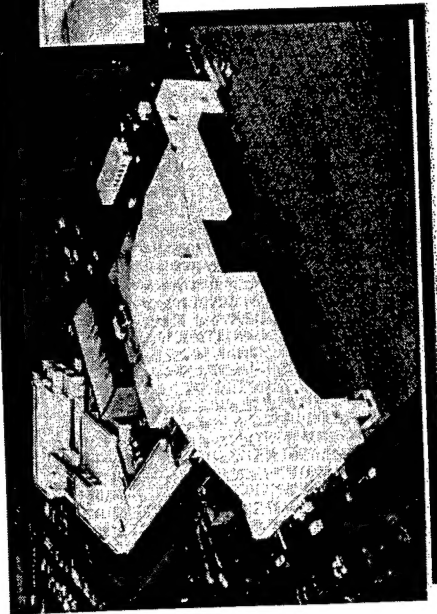


What is an ISTF?

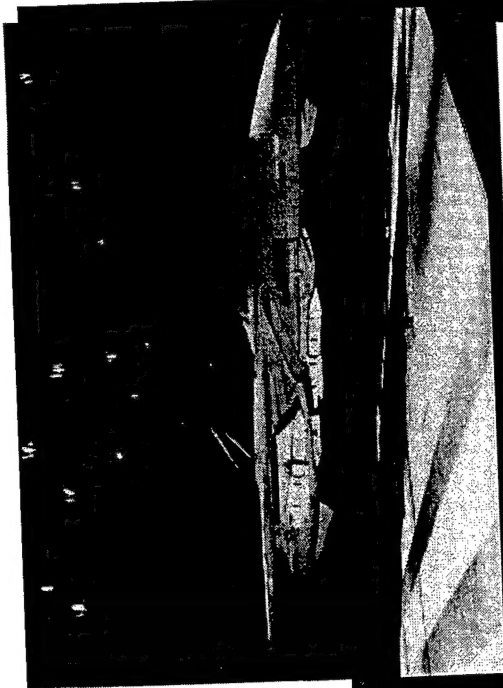


Installed System Test Facility (ISTF)- A facility where avionics installed and integrated in their host platform can be stimulated to determine performance.

HANGARS



ANECHOIC CHAMBERS



**SIMULATION &
STIMULATION
LABS**



Requirement



•DoD Directive 5000.2

- "...threat or threat representative forces, targets, and threat countermeasures, validated in coordination with DIA, shall be used"
- "Whenever models and simulations are to be used: identify the planned models and simulations; explain how they are proposed to be used; and provide the source and methodology of the verification, validation, and accreditation underlying their credible application for the proposed use."



Definitions



VERIFICATION - The process of determining that a model implementation accurately represents the developers conceptual description and specifications.

DoDD 5000.59

REQUIRES:

- State of the art test equipment for measurement of stimulator parameters
- Design specification validation report (DSVR) meetings attended by laboratory personnel
- Complete assessment of stimulator actual operation vs intended operation by laboratory personnel



Definitions

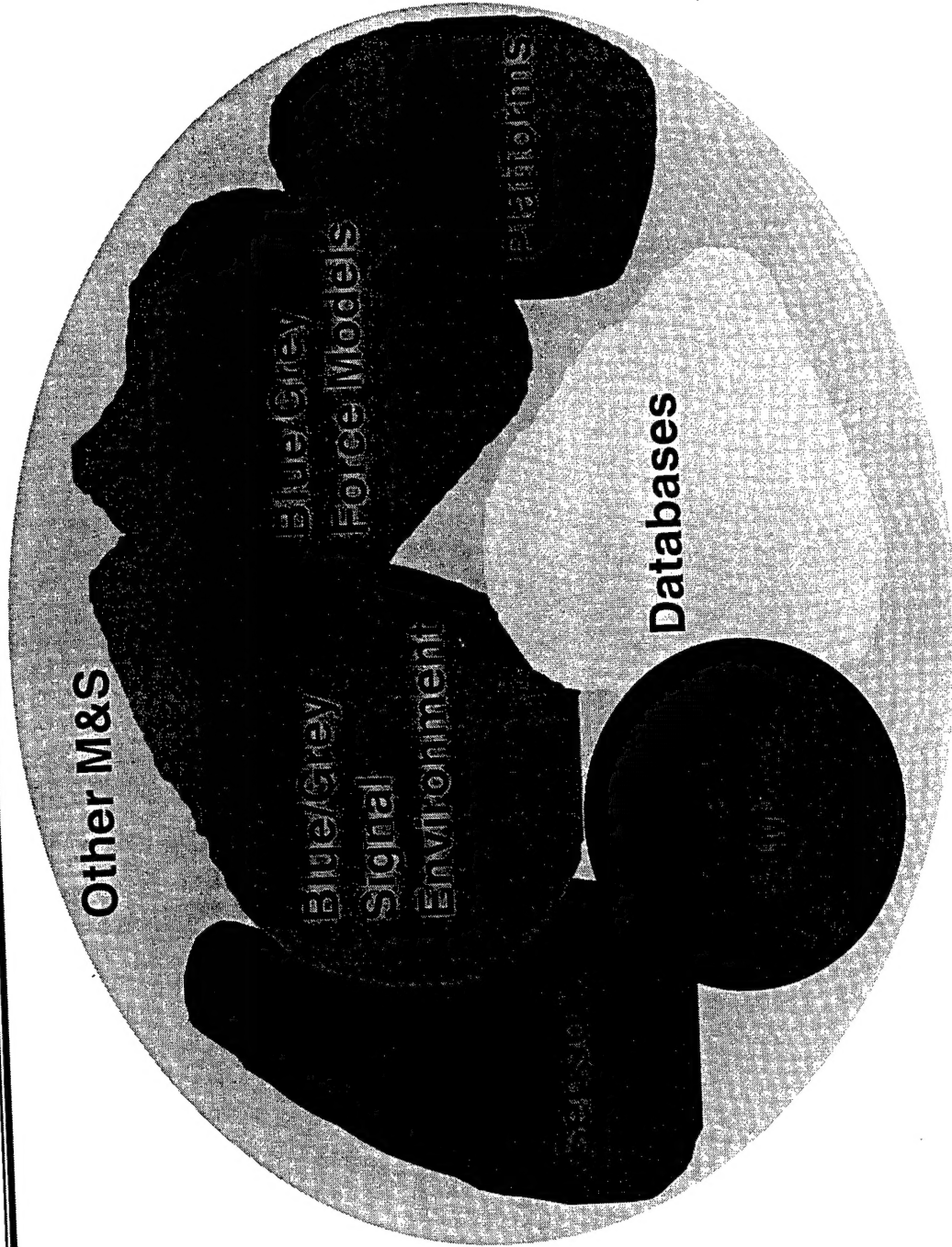


VALIDATION - The process of determining the degree to which a model is an accurate representation of the real world from the perspective of the intended uses of the model.

DoDD 5000.59

- Threat SIMVAL is a well-defined, established process
- Validation for the universe of other models and simulations is not yet well-defined
- Defense Modeling and Simulation Office (DMSO) initiatives encompass the “gray” areas

Modeling and Simulation Universe





ISTF Validation



- Threat SIMVAL focuses on relatively static *things*: Threat Simulators
 - Once device and signal is validated, it remains so unless object being modeled changes
- Flexibility and complexity of ACETEF requires focus on *tests*
 - Scenarios, stimulator mix, test objectives all may change from test to test
 - Requires some validation activity for each test configuration



WHAT IS SO HARD ABOUT V&V IN AN ISTF?!



- Multiple complex simulations of various types
- Physical placement of stimulator hardware
- Unforseen interactions between stimulators and the system under test

***AN AGGREGATION OF VALIDATED
STIMULATORS IS NOT NECESSARILY VALID!***



US Navy ISTF



Air Combat Environment Test and Evaluation Facility

Test installed avionics systems

Provide a realistic simulated environment

Provide ground test to complement flight test

Maximize platform test productivity

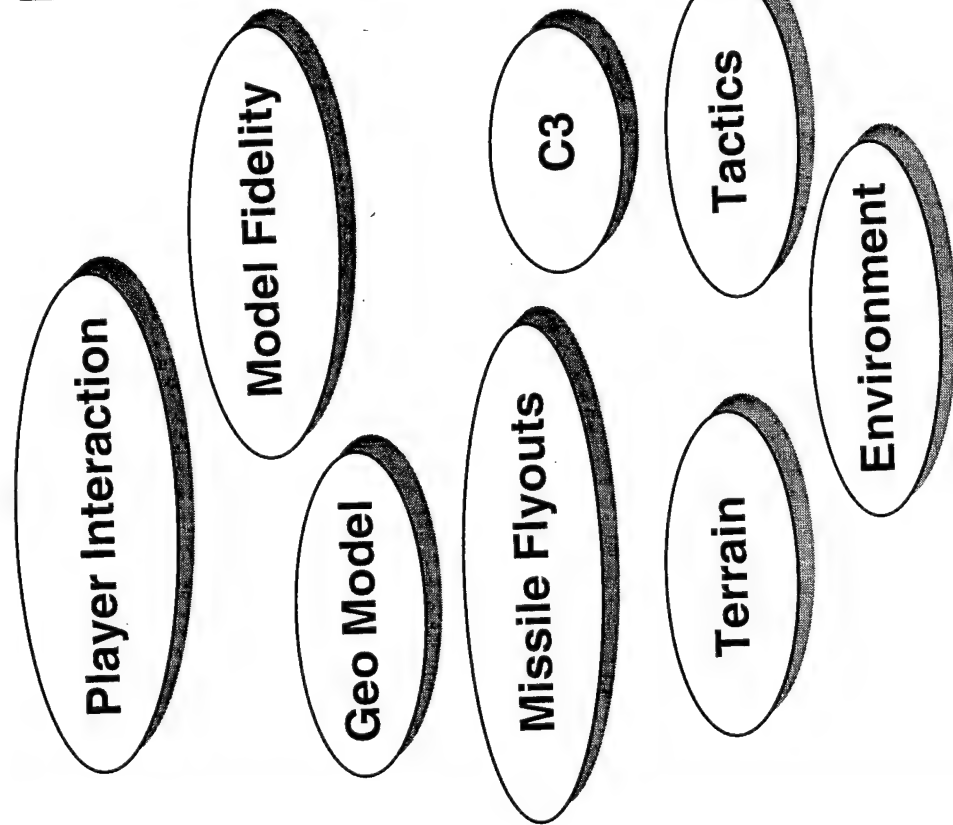
Reduce program risk!



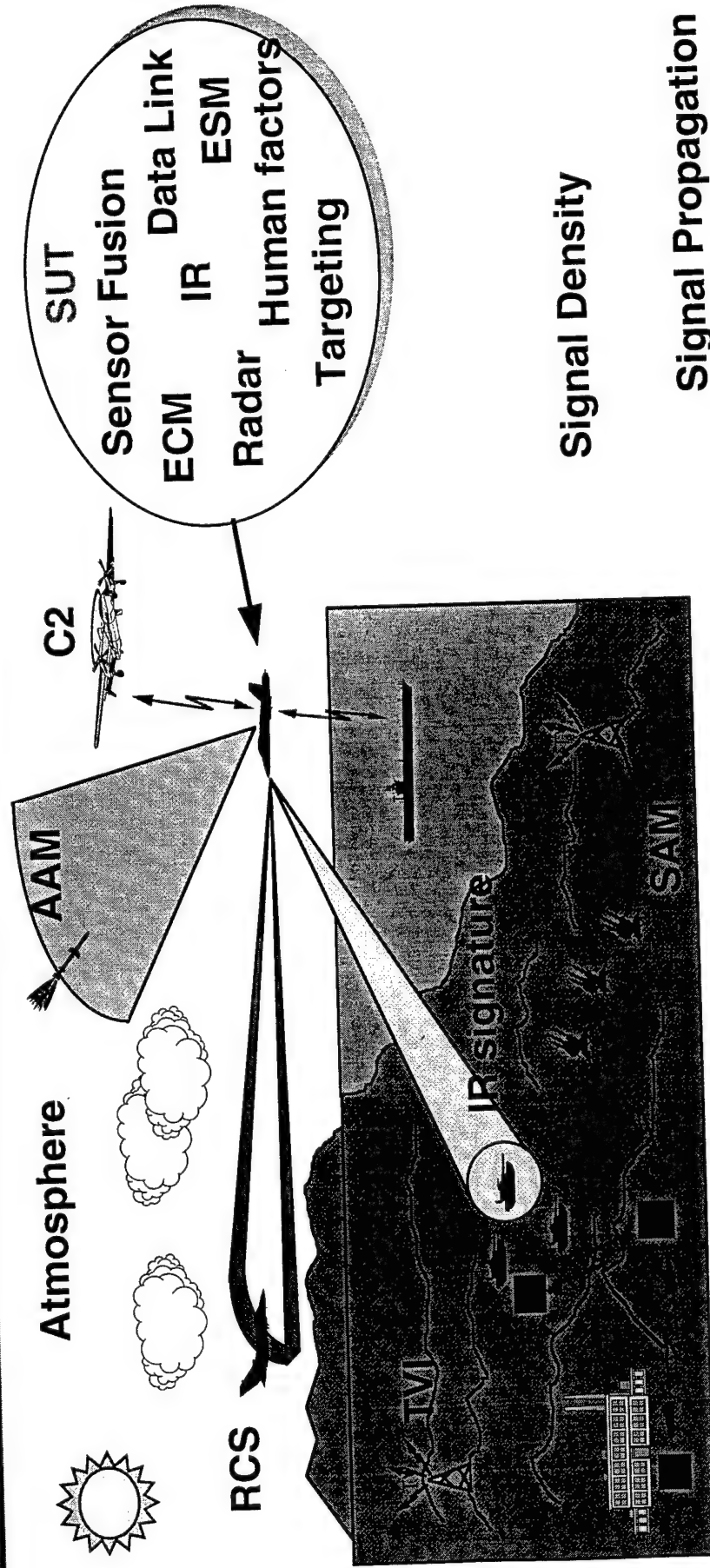
ACETEF Digital Model



Simulated Warfare Environment Generator (SWEG)



ACETEF Stimulations



Signal Density

Signal Propagation

Clutter

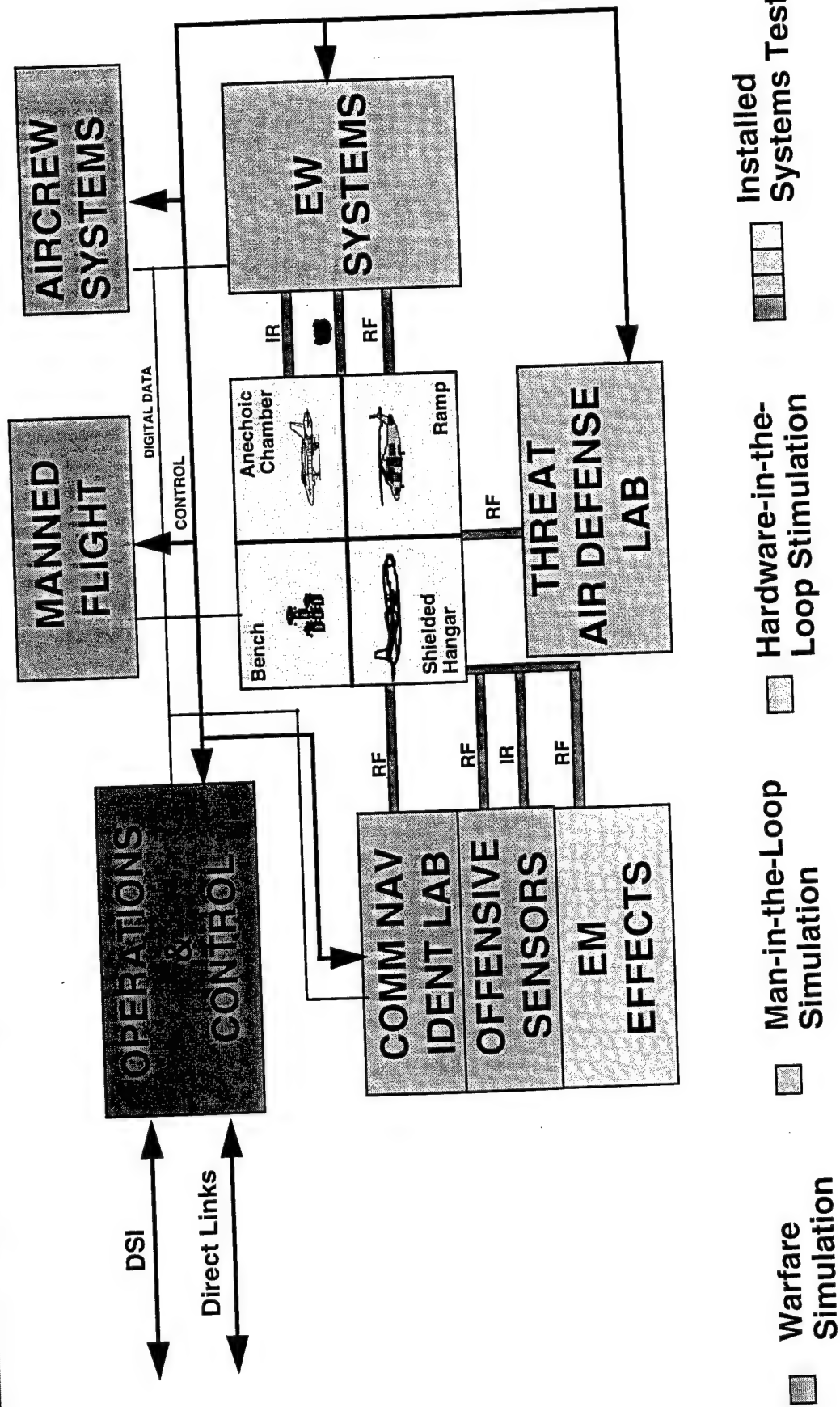
Stimulator Geometry

Man-in-the-Loop

Antenna Patterns

Electronic order of battle

ACETEF ARCHITECTURE



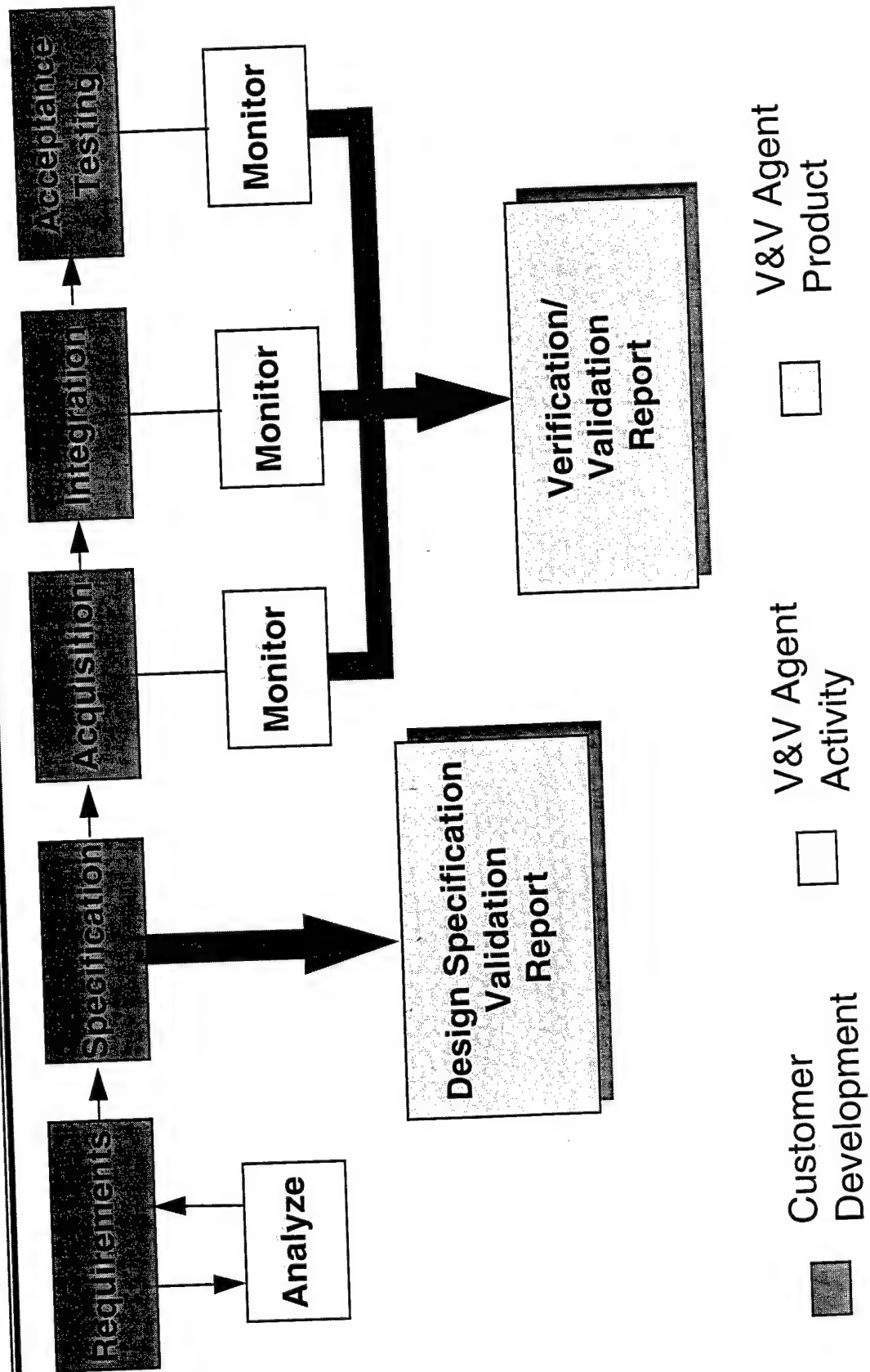


Testing Issues

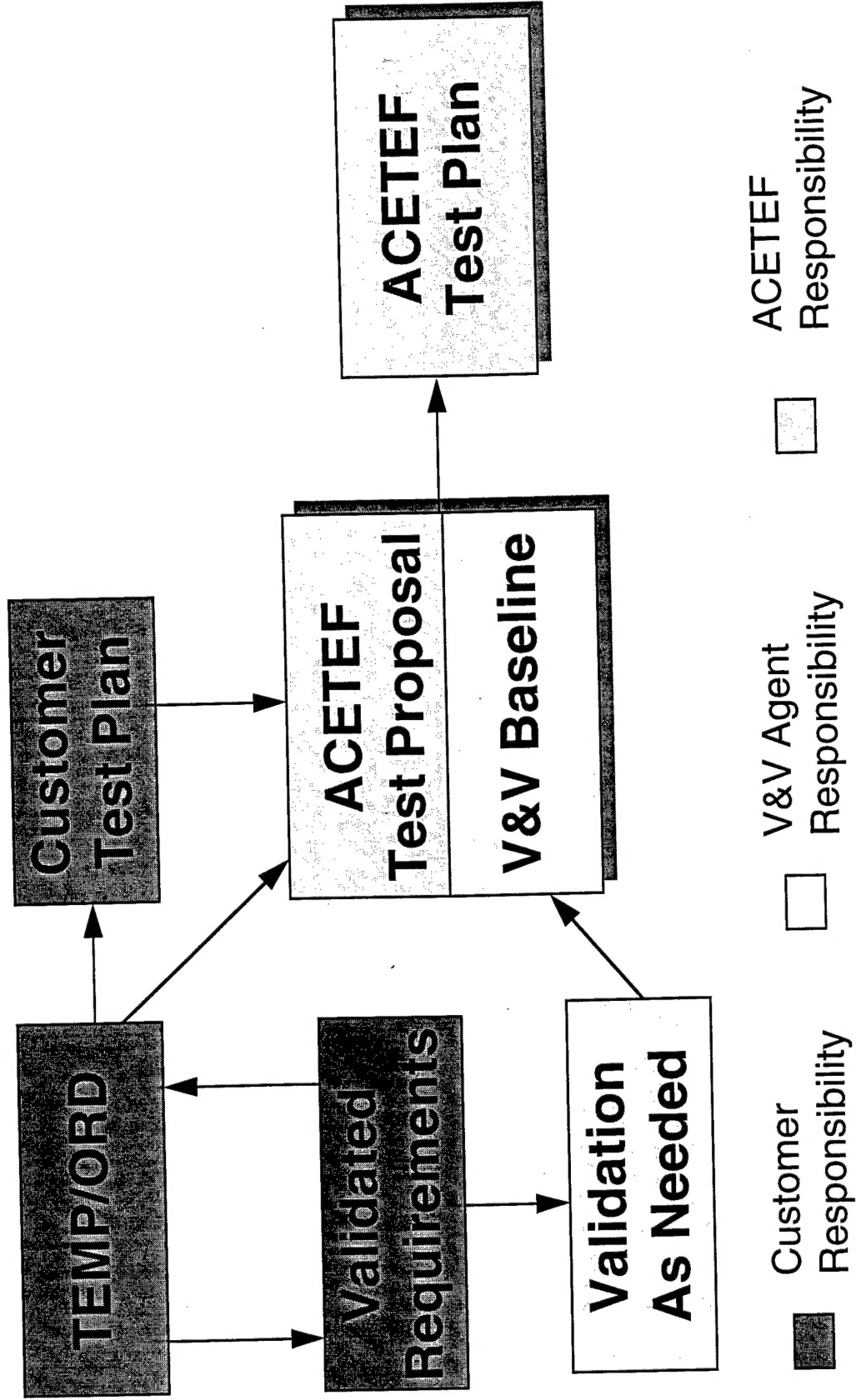


- Realistic system under test loading
- Realistic "test" C4I Architectures/ Loading
- Realistic/varied background
- "Coherent" Scenarios
- Integration of Missile Warning and Countermeasures
- IR and Semi-active Missile Seeker end game testing.
- Highly dynamic scenarios
- Numbers/types of targets
- Coordination of Surveillance Assets
- Training/Calibration of Knowledge Based Algorithms vs testing

Development Process



Test Planning Process





Internal V&V Agent Role



- Perform internal verification and validation of tests
- Ensure repeatability (and document for reproducibility)
- Ensure quality control
- Produce validation reports in the format usable by accreditors
- Assist external validators in understanding and validating ACETEF systems
- Ensure that new ACETEF systems can be validated



Conclusions

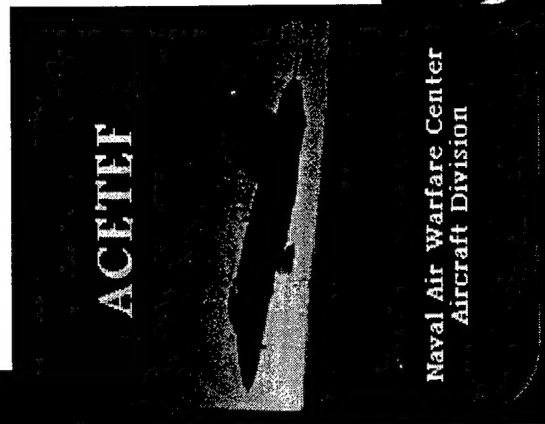


- Modeling and Simulation has a lot to *prove* to the test community
- COST EFFECTIVENESS has two dimensions
 - Can we reduce the cost of testing by supplanting flight tests with M&S tests?
 - Can we test scenarios that would otherwise be *unaffordable* to test?

A sound ISTF V&V process is critical to the establishment of M&S credibility

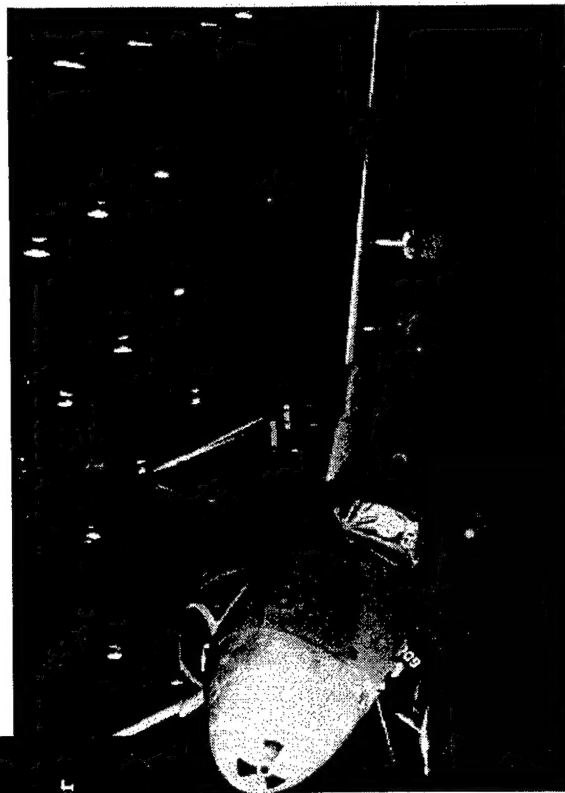


ACETEF on the WEB



ACETEF

Naval Air Warfare Center
Aircraft Division



<http://setd.nawcad.navy.mil>